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needed," and we think he is just the person to write it. But if this is too great an undertaking at present, why not bring out a monograph of the New York species with colored plates, to be printed in the Museum series of quarto volumes; it would be of great scientific value, and of lasting credit to its author.

For the information of those who may not be aware of the fact we will state that the 32d report of the botanist, which was never distributed, may be found in Assembly Document 89 for 1879, vol. 6.

A Synopsis of the Bacteria and Yeast Fungi and allied species. By W. B. Grove, B. A. Chatto and Windus. London, 1884. 12°. 112 pp. 87 illustrations.

The account of these two classes of plants given by Winter in the last edition of Rabenhorst's *Kryptogamen Flora von Deutschland*, etc., has furnished the basis for several English works, and none more serviceable than the one in hand. Somewhat over half the book is practically a translation from that work, with notes by the translator, and some additional species, principally from Van Tieghem, Burrill, Kock and Hausen. Additional cuts are also introduced from various sources, of which the most interesting are those from Dallinger showing flagella. A chapter is given to forms which are inadequately known, or whose true bacterial nature is undecided, with such as could not be placed in the previous classification. These embrace over forty names from Zopf, Lankester, Lister, Thin, Engelmann, Warming, Van Tieghem, Klein, Ehrenberg and many others.

This, in the present unsatisfactory state of knowledge regarding these minute organisms, provides a very useful manual, giving good descriptions and illustrations, and indicating to some extent the synonymy and literature. The cuts are numerous and clear, but in many instances have lost in the reproduction much of the nicety of outline that gives individuality to the organism.

An interesting feature of the work is the chapter on classification in which the progress of classification is traced and the systems given that have been proposed at various times. The views that are more or less opposed to the classification of bacteria by Cohn are stated briefly but clearly and impartially. They are by Lister, Lankester, Cienkowski, Nägeli, Haberkorn, Neelsen and others, but especially by Zopf. The views of the latter on pleomorphism and its dangers are discussed, closing with a statement of the true nature of species among the schizophytes. In regard to the rank of the yeast plants considerable space is given to the hypothesis of Brefeld, who considers them to be a conidial stage of other fungi, probably of the smuts.

Appendices give information regarding the unit of micro-measurement, staining of Bacillus tuberculosis, and diseases produced by schizophytes. A full index completes the work.

The excellent appearance of the work and no less excellent contents should bring it into the hands of many workers.

NOTES AND NEWS.

DR. FRANZ, Baron Ungern-Sternberg, known as monographer of the Salicorniæ, died in Turin, Italy, August 12, 1885.

AN APPARATUS to demonstrate before classes or large audiences the manner in which the cambium gives rise to wood and bast, has been devised by Dr. F. Noll, of Heidelberg, and is highly spoken of by Professor Sachs.

DR. WINTER, of Leipsig, and C. H. Demetrio, of St. Louis, publish, in *Hedwigia*, a list of 350 species of various kinds of fungi collected in Missouri. Twenty-five new species are described, including six of Septoria and eight of Cercospora.

SIR JOSEPH D. HOOKER, after twenty years' service, resigned the Directorship of the

Kew Gardens on November 30. Being relieved of administrative duties he will have more time for the more important systematic work which he has on hands.

THE JOURNAL OF MYCOLOGY closes its first year with an expression of satisfaction at its reception and success, and promise of more varied contents, articles for beginners, and biological sketches of eminent mycologists for the coming year.

VERY CONSIDERABLE ATTENTION is devoted to hybrid forms of common wild plants in Sweden, judging from the frequent descriptions of named sorts in the *Botaniska Notiser*. They are species, some well known in this country as weeds, of such genera as Epilobium, Rosa, Primula, Rumex, etc.

COOKE'S PROVISIONAL LIST of the British Sphæropsideæ, publishing in *Grevillea*, reaches in the December issue to No. 478, having just entered the genus Septoria. The *Synopsis Pyrenomycetum*, begun in June, 1884, now reaches No. 2134. Only a few of these numbers are accompanied by descriptions.

THE DRUGS AND MEDICINES of North America, published in Cincinnati, is a far more important serial to non-medical botanists than its name would indicate. Its matter is original and fresh, and to a considerable degree strictly botanical; it includes synonymy, literature, description, distribution presented by maps, and minute anatomy, after which comes the medical portion. Even the latter need not be left entirely to the physician. It is printed on excellent paper and the illustrations are copious and admirably executed.

A PRIZE of 500 francs ($100) is offered for the best unpublished monograph on a class or amily of plants, the award to be made in October, 1889. It may be written in English, and is to be sent to the *Société de Physique et d'Histoire Naturelle*, Geneva, Switzerland. The prize was founded by A. P. De Candolle. It would be a matter of just pride if some really valuable memoirs were presented by American botanists for this, and also for the Walker prize in plant embryology, which is announced in our advertising columns.

F. EMICH has made extended researches upon the self-purification of natural waters, (detailed in *Biedermann's Centralblatt für Agrikultur Chemie*) and finds that direct oxidation from the air does not occur and that ozone and peroxide of hydrogen play but a feeble part, if any. When exposed to air or agitated with it, purification does not take place if the water has been sterilized by boiling or germs are in any way excluded. The entire question of purification of rivers and other open channels is obviously removed from the sphere of chemistry and becomes purely biological.

THE AUCTION sale of the Morgan collection of orchids in New York City some months since developed the fact that considerable attention is given to orchid cultivation in this country. The sale included over 1,450 plants, very few of them in flower at the time, for which Mrs. Morgan is said to have paid $200,000. A specimen of Vanda Sanderiana, bought by Veitch & Sons of London, brought $900, the highest price paid for a single plant; it is said to have cost $2,000. It is a rare and lovely species from Mindanao, one of the southern Phillipine islands, and first flowered in cultivation about two years ago. Another equally good plant of this species is owned by Mr. F. L. Ames of North Easton, Mass. Nine plants of Cypripedium brought from $100 to $750 each, all but one going to England.

THE ANNUAL FUNGUS FORAYS of England are an interesting feature of mycologic study in that country. They are excursions arranged by the societies to some collecting ground, where the party tramps through the fields, collecting fungi especially, and in the evening dines with a liberal *cuisine de champignon*, if the day has been successful. After the day's collecting the finds are displayed, named and commented upon. In the evening are papers and discussions. The meetings last from one to four days, and usually take place in October. The year 1885 proved a poor season for the larger fungi, and the gatherings have therefore lacked somewhat in interest. The Essex Field Club gave two days, the Tunbridge Wells Nat. Hist. Society, the Hertfordshire Nat. Hist. Society, the Hackney Nat. Hist. Society and the Leicester Nat. Hist. Society one day each, and the Woolhope Club four days.

STRASBURGER, at a meeting of the German Botanical Society on the 17th of September last, presented the results of some recent experiments (not yet completed) to ascertain the limits within which plants specifically distinct will permit effective grafting or budding, and the reciprocal influence of the stock and graft. He grafted a large number of various species of Solanaceæ on Solanum tuberosum and *vice versa*. Almost all of the grafts "took" and union was complete. The best results were obtained with Datura Stramonium on Solanum, the specimens of which formed good-sized tubers containing a small quantity of *atropine!* He also succeeded in grafting the Scrophularineous Schizanthus Grahami on Solanum, a most interesting result, and probably the first authentic instance of the union of two plants of different orders. He was led to attempt this because the potato-rot fungus develops on Schizanthus. The further results of these experiments and the promised histological investigation will be looked for with interest. The present paper is published in *Berichte d. deut. bot. Gesell. iii, XXXIV.* (Nov. 19, 1885).

ANOTHER PAPER is to be added to the already voluminous literature of the apparently interminable discussion of the morphology of the female flower of the Coniferæ. Kramer, in a recent paper[1], espouses the idea that in the Cupressineæ the scales of the cone are carpels which bear the ovules in their axils, and that the peculiar contour of these scales is not due to the coalescence of two organs, the bract and carpellary scale (*Deckschuppe* and *Fruchtschuppe*) as claimed by some, but is produced by mere swellings of no morphological significance. In the Abietineæ he considers the *Deckschuppe* of Strasburger and others as the carpel and their *Fruchtschuppe* as the placenta formed in its axil. This placenta, instead of remaining small, increases greatly in size, the more rapid growth of the under side reverses the position of the ovules, and it finally encloses them completely. According to this view of course the cone of these tribes would be considered a single flower and not as an inflorescence. Much has been said on both sides—and still it is doubtful where the truth is. An account of the development of the cones of fourteen species of Cupressineæ and Abietineæ forms the bulk of the paper.

WHAT IS CALLED a case of symbiosis between a fungus and the roots of certain trees has been described by Frank in the *Berichte der deutschen botanischen Gesellschaft.*[2] The fungus completely invests the absorbing rootlets of the trees, so that the nutritive solutions pass through the mycelium before entering them. To this symbiotic condition he applies the term Mycorhiza, and in a more recent contribution[3] to the same subject he makes *en resumé* these statements: 1. Mycorhiza is a symbiotic relation of which perhaps all trees are capable under certain conditions. This has been observed in almost all Cupuliferæ, in Coniferæ and Salicaceæ, in the Betulaceæ nearly allied to Cupuliferæ, in the linden and Prunus spinosa. 2. Mycorhiza is formed only in a soil which contains humus or undecomposed vegetable matter. The development of mycorhiza diminishes with the poverty and increases with the richness of the soil in these constituents. It has been observed to vary even on the same root as it passes through different layers of soil containing different amounts of organic matter. 3. The fungus of mycorhiza supplies to the tree, in addition to the necessary water and organic and mineral nutritive matters, substances derived directly from the humus and decaying vegetable matter. The tree is capable of this immediate reconversion of organic vegetable *débris* for nourishment only through the intervention of the mycorhiza fungus. 4. The old theory of the direct nutrition of green plants by humus will be revived though with a modified meaning. 5. The importance of humus and fallen leaves for the nutrition of forests acquires a new theoretical support. 6. While the symbiotic nutrition is chiefly of importance where, as in trees, it assists in the production of vast quantities of vegetable matter and where the immediate reconversion of vegetable *débris* is highly helpful, yet mycorhiza can render service when nutrition from humus becomes a necessity on account of the absence of chlorophyll, as in Monotropa Hypopitys.

It is to be noticed, however, that in neither of his papers on the subject has Frank demonstrated that this is a genuine symbiotic relation. The mycelium is sterile and no cultures or infection experiments have been carried on. The observed facts are interesting and probably important, but it will be well to hold aloof from his hypothesis of symbiosis until more exact knowledge is obtained.

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[1] Beiträge zur Kenntniss der Entwickelungsgeschichte und des anatomischen Baues der Fruchtblätter der Cupressineen und der Placenten der Abietineen.—Flora, Nos. 29, 30, 31, 1885.

[2] Band iii, heft 4, p. 128.

[3] Berichte d. deut. bot. Gesell., iii, XXVII; Nov. 19, 1885. In this paper he shows the existence of the same symbiosis between the fungus and roots of Monotropa Hypopitys.